

# Composition of the essential oil of *Caucalis platycarpos* L.

---

**Bucar, Franz; Maleš, Željko; Kujundžić, Nikola**

*Source / Izvornik:* **Acta Pharmaceutica, 2001, 51, 219 - 223**

**Journal article, Published version**

**Rad u časopisu, Objavljena verzija rada (izdavačev PDF)**

*Permanent link / Trajna poveznica:* <https://um.nsk.hr/um:nbn:hr:163:973381>

*Rights / Prava:* [In copyright](#)/[Zaštićeno autorskim pravom.](#)

*Download date / Datum preuzimanja:* **2025-02-10**



*Repository / Repozitorij:*

[Repository of Faculty of Pharmacy and Biochemistry University of Zagreb](#)



## Composition of the essential oil of *Caucalis platycarpus* L.\*

FRANZ BUCAR<sup>1\*\*</sup>  
ŽELJAN MALEŠ<sup>2</sup>  
NIKOLA KUJUNDŽIĆ<sup>3</sup>

<sup>1</sup> Institute of Pharmacognosy  
University of Graz  
A-8010 Graz, Austria

<sup>2</sup> Department of Pharmacognosy  
Faculty of Pharmacy and Biochemistry  
University of Zagreb  
10000 Zagreb, Croatia

<sup>3</sup> Department of Analytical Chemistry  
Faculty of Pharmacy and Biochemistry  
University of Zagreb  
10000 Zagreb, Croatia

Results of the investigation of the composition of the essential oil obtained by hydrodistillation of the aerial parts of *Caucalis platycarpus* L. (*Apiaceae*) are presented.

Essential oil was analyzed by GC-MS. The oil proved to be rich in sesquiterpenes. Spathulenol (10.0%) was the main compound of the oil.

**Keywords:** *Caucalis platycarpus* L. (*Apiaceae*), essential oil, GC-MS

Received April 18, 2001

Accepted July 19, 2001

*Caucalis platycarpus* L. (= *Caucalis daucooides* L., *Caucalis lappula* Grande) is an annual herb, belonging to the family *Apiaceae*, of widespread distribution in the Mediterranean and Central Europe. It is up to 40 cm high, with leaves pinnately divided into oblong or lanceolate lobes, almost glabrous, white or pink flowers, and ellipsoid to ovoid fruits (1).

The dried decoction of this plant showed a remarkable antitumor activity as a consequence of the stimulation of the immunological system of the host (2).

Chemical investigations have detected a number of constituents, including flavonoids, essential oil, starch, cellulose, proteins, carbohydrates, lignin, tannins,  $\beta$ -sitosterol and scopoletin (3–5).

This work represents the first detailed investigation of the composition of the essential oil of the aerial parts of *Caucalis platycarpus* L.

\* Presented at the 2<sup>nd</sup> Croatian Congress on Pharmacy, Cavtat, May 31 – June 3, 2001

\*\* Correspondence, e-mail: franz.bucar@kfunigraz.ac.at

## EXPERIMENTAL

### *Plant material*

Aerial parts of *C. platycarpus* were collected in 1998 in the surroundings of Imotski (Croatia). Voucher specimen (No. 99100) has been deposited in the Herbarium of the Department of Pharmacognosy, Faculty of Pharmacy and Biochemistry (University of Zagreb, Croatia). Moisture content was determined on the basis of the loss by drying according to the method of ÖAB (11).

### *Distillation of the essential oil*

The sample was air dried in the shadow and cut into small pieces before distilling. Hydrodistillation of the essential oil was carried out for 2 h in an apparatus according to Eur. Ph. (6).

### *GC-MS analysis*

The analysis was performed on a HP 5890 Series II Plus gas chromatograph interfaced to a HP 5989B mass spectrometer (Hewlett-Packard, USA); columns: 1. fused silica capillary column Ultra 2 (Hewlett-Packard) ( $l = 46$  m,  $ID = 0.20$  mm) with 5%Phe95%Me silicone as stationary phase, coating thickness  $0.11\ \mu\text{m}$ ; 2. fused silica capillary column DB Wax (J&W Scientific) ( $l = 57$  m,  $ID = 0.25$  mm), stationary phase polyethylene glycol, coating thickness  $0.25\ \mu\text{m}$ .

Working conditions for Ultra 2 column: injector temperature  $250\ ^\circ\text{C}$ , interface temperature  $280\ ^\circ\text{C}$ ; linear oven temperature program from  $70$ – $200\ ^\circ\text{C}$  with  $2\ ^\circ\text{C}\ \text{min}^{-1}$ , carrier gas: helium 5.0, flow rate:  $1.0\ \text{mL}\ \text{min}^{-1}$ , split ratio 40:1. Working conditions for DB Wax column: injector temperature  $230\ ^\circ\text{C}$ , interface temperature  $250\ ^\circ\text{C}$ , linear oven temperature program from  $70$ – $230\ ^\circ\text{C}$  with  $2\ ^\circ\text{C}\ \text{min}^{-1}$ , carrier gas: helium 5.0, flow rate:  $1.0\ \text{mL}\ \text{min}^{-1}$ , split ratio 40:1.

The mass spectrometer operated in the electron ionization mode ( $70\ \text{eV}$ ), ion source temperature was  $200\ ^\circ\text{C}$ , quadrupole temperature was  $100\ ^\circ\text{C}$ .

The compounds were identified upon comparison with reference compounds, mass spectra library search and retention index references (7–10).

Quantification of the relative amounts of individual components was done according to the area percent method, disregarding calibration factors.

## RESULTS AND DISCUSSION

Hydrodistillation of the aerial parts of *C. platycarpus* yielded  $0.05\%$  ( $V/m$ ) of essential oil (calculated on the dry mass basis, taking a moisture content of the dried plant material of  $5.6\%$  into account).

The essential oil was analyzed by GC-MS using two stationary phases of different polarity. The results are shown in Table I. The composition of the oil was rather complex.

Table I. Composition (%) of the essential oil of *Caucalis platycarpus* L.

No.	Compound	Area (%)	RI (polar) (DB-Wax)	Identifi- cation <sup>a</sup>
1	$\alpha$ -Pinene	0.3	1030	1,2,3
2	(E)-1,3-Nonadiene	0.9	1052	2
3	Camphene	<0.1	1076	1,2,3
4	$\beta$ -Pinene	<0.1	1119	1,2,3
5	Sabinene	0.2	1127	1,2,3
6	$\alpha$ -Terpinene	0.3	1186	1,2,3
7	Limonene	0.1	1206	1,2,3
8	$\beta$ -Phellandrene	0.1	1215	2
9	2-Pentylfuran	0.1	1230	2
10	$\gamma$ -Terpinene	0.8	1248	1,2,3
11	<i>p</i> -Cymene	0.4	1272	1,2,3
12	$\alpha$ -Terpinolene	0.4	1287	1,2,3
13	1-Octanal	0.2	1289	1,2,3
14	1-Nonanal	0.8	1392	1,2,3
15	<i>p</i> -Mentha-1,5,8-triene	0.2	1427	2
16	1-Methyl-2-(2-propenyl)-benzene	0.3	1434	2
17	Linalooloxide ( <i>trans</i> )	0.5	1441	2,3
18	$\alpha$ -Cubenene	0.1	1458	1,2,3
19	Linalooloxide ( <i>cis</i> )	0.2	1469	2,3
20	2-Ethyl-1-hexanol	0.3	1486	2
21	$\alpha$ -Campholenaldehyde	0.1	1491	2
22	$\alpha$ -Copaene	0.1	1493	1,2,3
23	Dihydroedulan II	0.4	1494	2,3
24	3-Nonen-2-one	0.4	1508	2
25	(E)-2-Nonenal	3.8	1531	2
26	Linalool	1.6	1542	1,2,3
27	1-Octanol	0.5	1554	2,3
28	$\beta$ -Elemene	0.2	1587	2,3
29	<i>trans</i> -Caryophyllene	1.0	1596	1,2,3
30	Terpinen-4-ol	2.2	1600	1,2,3
31	<i>p</i> -1-Menthen-9-al	1.7/1.5	1611/1615	2
32	$\gamma$ -Elemene	0.3	1636	2,3
33	2,6,6-Trimethyl-1,3-cyclohexadiene-1-carboxaldehyde	0.3	1641	2
34	1-Nonanol	0.5	1658	2
35	$\alpha$ -Terpineol	1.0	1694	1,2,3
36	$\alpha$ -Muurolene	0.8	1722	2,3
37	$\delta$ -Cadinene	1.7	1755	2,3
38	1-Decanol	0.2	1761	2
39	4-(1-Methylethyl)-benzaldehyde	0.3	1774	2
40	$\beta$ -Damascenone	0.5	1817	2,3
41	(1E, 4Z)-Germacrene B	1.3	1826	2,3
42	<i>trans</i> -Geraniol	0.6	1845	2,3
43	6,10-Dimethyl-5,9-undecadien-2-one	0.6	1850	2
44	$\beta$ -Jonone	1.2	1934	2
45	Caryophyllenoxide	3.1	1979	2,3
46	Spathulenol	10.0	2120	2,3
47	6,10,14-Trimethyl-2-pentadecanone	0.8	2143	2
48	T-Muurolol	0.8	2183	2
49	2-Hydroxy-5-methoxybenzaldehyde	2.0	2405	2

<sup>a</sup> Mode of identification: 1 – co-GC (with reference compounds); 2 – MS-library search (Wiley 138K and own laboratory data base); 3 – comparison of retention indices with refs. 7–10

Forty-nine compounds, representing about 45% of the total peak area could be identified, while a number of peaks with  $M_r = 220$  and 222 could only be classified as oxidized sesquiterpenes. Altogether, 12 monoterpene hydrocarbons were identified,  $\gamma$ -terpinene (0.8%) being the main compound in this group. Sesquiterpene hydrocarbons were present in minor amounts as well. Major representatives of this class of compounds (of 8 identified) were  $\delta$ -cadinene (1.7%), (1E, 4Z)-germacrene B (1.3%), and *trans*-caryophyllene (1.0%). Oxidized monoterpenes and sesquiterpenes were present in higher percentages. Nine oxidized monoterpenes could be found in the essential oil; terpinen-4-ol (2.2%) and linalool (1.6%) were the major compounds in this fraction. Two adjacent peaks with linear retention indices of 1611/1615 (polar column) and 1214/1216 (non polar column) showed identical mass spectra of *p*-1-menthen-9-al; two stereoisomers are most probably present in the oil. *p*-1-Menthen-9-al was previously found, among others, in some *Umbelliferae* oils (12, 13). Only a few reference spectra were available for oxidised sesquiterpenes. Spathulenol represented the major compound of the oil (10.0%).

Noticable amounts of compounds belonging to classes other than mono- or sesquiterpenes were present, such as the aldehydes 1-octanal, 1-nonanal and (E)-2-nonenal (3.8%). Two benzaldehydes (4-(1-methylethyl)-benzaldehyde and 2-hydroxy-5-methoxybenzaldehyde) were identified as well. Dihydroedulan II (2,3,4,4a,5,6-hexahydro-2,5,5,8a-tetramethyl-(8aH)-1-benzopyrane), originally found as a trace compound in the juice of *Passiflora edulis* (10), was previously also identified in the essential oil obtained from another *Apiaceae* species, *Aegopodium podagraria* (8).

In an earlier investigation, Williams and Harborne (4) detected high amounts of  $\beta$ -pinene (9%) in the essential oil obtained from the fruits of *C. platycarpus*. Our analysis revealed  $\beta$ -pinene only as a trace compound in the oil of the aerial parts. Hence, further analyses dealing with the variation of the oil composition should be carried out.

## CONCLUSIONS

The essential oil of the aerial parts of *Caucalis platycarpus* contained monoterpene and sesquiterpene hydrocarbons only in smaller amounts, whereas oxidized monoterpenes and sesquiterpenes were present in higher percentages. Furthermore, a number of compounds belonging to classes other than mono- and sesquiterpenes, namely aldehydes like (E)-2-nonenal, two benzaldehydes and dihydroedulan II, were identified.

## REFERENCES

1. T. G. Tutin *et al.* (Eds.), *Flora Europaea*, Cambridge University Press, Cambridge 1968, Volume 2, p. 372.
2. M. Kujundžić, I. Bašić and N. Kujundžić, Therapy of liver metastases of colorectal cancer by plant extract from *Caucalis platycarpus* L., *Acta Pharm.* 47 (1997) 39–45.
3. J. B. Harborne and C. A. Williams, Flavonoid patterns in the fruits of the Umbelliferae, *Phytochemistry* 11 (1972) 1741–1750.
4. C. A. Williams and J. B. Harborne, Essential oils in the spiny-fruited Umbelliferae, *Phytochemistry* 11 (1972) 1981–1987.

5. N. Kujundžić, G. Stanić and I. Vukušić, A study of the chemical composition of the plant *Caucalis platycarpus* L., *Acta Pharm.* 42 (1992) 91–93.
6. *European Pharmacopoeia*, 3<sup>rd</sup> ed., Council of Europe, Strasbourg 1996, p.121.
7. N. W. Davies, Gas chromatographic retention indices of monoterpenes and sesquiterpenes on methyl silicone and Carbowax 20M phases, *J. Chromatogr.* 503 (1990) 1–24.
8. F. Bucar and U. Schweiger, in: *Essential oils*, Ch. Franz et al. (Eds.), Proceedings of the 27<sup>th</sup> International Symposium on Essential Oils, September 8–11, 1996, Vienna, Austria, Allured 1997, pp. 197–199.
9. D. Joulain and W. A. König, *The Atlas of Spectral Data of Sesquiterpene Hydrocarbons*, E.B.-Verlag, Hamburg 1998.
10. G. D. Prestwich, F. B. Whitfield and G. Stanley, Synthesis and structures of dihydroedulan I and II trace components from the juice of *Passiflora edulis* Sims, *Tetrahedron* 32 (1976) 2945–2948.
11. *Österreichisches Arzneibuch (Pharmacopoea Austriaca)*, Amtliche Ausgabe 1990, Verlag Österreich, Vienna 1990, Vol. 1, p. 10.
12. G. Vernin, C. Parkanyi, G. M. F. Vernin and R. M. Zamkotsian, Studies of plants in the Umbelliferae family. II. GC/MS analysis of celery seed essential oils, *Dev. Food Sci.* 34 (1994) 329–345.
13. M. Ashraf, P. J. Sandra, T. Saeed and M. K. Bhatti, Studies on the essential oils of the Pakistani species of the family Umbelliferae. Part XXXIII. *Petroselinum crispum*, Miller (parsley) seed oil, *Pak. J. Sci. Ind. Res.* 22 (1979) 262–264.

## S A Ž E T A K

### Istraživanje kemijskog sastava eteričnog ulja podlanice – *Caucalis platycarpus* L.

FRANZ BUCAR, ŽELJAN MALEŠ i NIKOLA KUJUNDŽIĆ

Eterično ulje nadzemnih dijelova podlanice – *Caucalis platycarpus* L. (*Apiaceae*) dobiveno je postupkom hidrodestilacije, a njegov kemijski sastav analiziran je kombiniranom tehnikom plinske kromatografije i spektrometrije masa. Najzastupljenije sastavnice eteričnog ulja bili su seskviterpeni, posebice spatulenol (10,0%).

*Ključne riječi:* *Caucalis platycarpus* L. (*Apiaceae*), eterično ulje, plinska kromatografija-spektrometrija masa

*Institute of Pharmacognosy  
University of Graz, A-8010 Graz, Austria*

*Zavod za farmakognoziju i Zavod za analitičku kemiju  
Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu  
10000 Zagreb*